HUASUN

Module Technology for Agrivoltaics

No.1 in Heterojunction

CONTENT

About Huasun

#1 HJT manufacturer in the world

Sales Center

Nanjing·Jiangsu

Headquarters

Xuancheng·Anhui

Manufacturing Bases

Xuancheng·Anhui
Hefei·Anhui
Wuxi·Jiangsu
Dali·Yunnan

20GW

Annual Production Capacity of HJT Modules

Headquarters Sales Center Manufacturing Base

Motivation

Agricultural

Some configurations of PV use help **increase the agricultural yield** of the chosen land.

Additional agricultural yield will compensate the more expensive PV LCOE.

L'agrivoltaico può aumentare la resa dell'uva fino al 60%

Gwénaëlle Deboutte Dic 3 2024, 4:53pm

Economical

By having dual use of land, customers can have **two streams of revenue**, improving profitability of the land and giving more stability to the business.

Photovoltaic

Agricultural land is often not allowed for standard PV Plants. Many great locations (nearby HV nodes, sunny soft slopes) are agricultural only. Also special tariffs are upcoming.

Access to these lands is interesting for PV projects.

Kritik der aktuellen Förderung von Agri-Photovoltaik

28. JUNI 2024 RALF SCHNITZLER

MEINUNG DEUTSCHLAND

Ohne Ausschreibung eine staatlich garantierte EEG-Festvergütung von 9,5 Cent pro Kilowattstunde für 20 Jahre garantiert zu bekommen, ist offenbar sehr lukrativ. Das gilt nämlich seit dem "Solarpaket 1" für Photovoltaik-Freiflächenanlagen die weniger als ein Megawatt Peak-Leistung haben und zur Kategorie 1 der Agri-Photovoltaik nach DinSpec 91434 gehören. Damit sind senkrechte und/oder hoch aufgeständerte Solaranlagen gemeint. Es gibt Anbieter, die werben gezielt für dieses Segment und stellen Erträge von 110.000 bis 130.000 Euro pro Jahr in Aussicht. Bei 9,5 Cent pro Kilowattstunde Einspeisevergütung sind Agri-Photovoltaik-Anlagen – trotz höherer Bau- und Betriebskosten pro Kilowattpeak als normale Photovoltaik-Freiflächenanlagen – extrem rentabel zu betreiben. Erst recht, wenn sie im sonnenreichen Bayern oder in Baden-Württemberg stehen.

Implementation - **high post PV** / Shading PV

Source: Fraunhofer ISE

Source: NABU/R. Blessonohl

Source: TSE

Implementation - **low density PV** / low impact on agriculture

Source: Next2Sun

Source: ARRAY

Optimization - what is special in AgriPV?

Higher BOS	Higher Bifacial Gain

Structure	Land Coverage	BoS Cost	Bifacial Gain
High Post Fixed Tilt	High Density	++	+
High Post Tracker	Medium Density	+++	+
Vertical	Low Density	+	++++
Fixed Tilt	Low Density	+	++
Tracker	Low Density	++	+++

What do you most need to improve the system?

Low Installation Cost
Efficiency
High Power

High Yield
Bifacialty
Other Yield Parameters

… because BoS is high!

HJT is the best technology 2025 for this optimization

Lower Installation Cost	Topcon	BC Topcon	HJT Huasun
Efficiency	22.9%	23.7%	23.3%
High Power	710W	640W *	725W

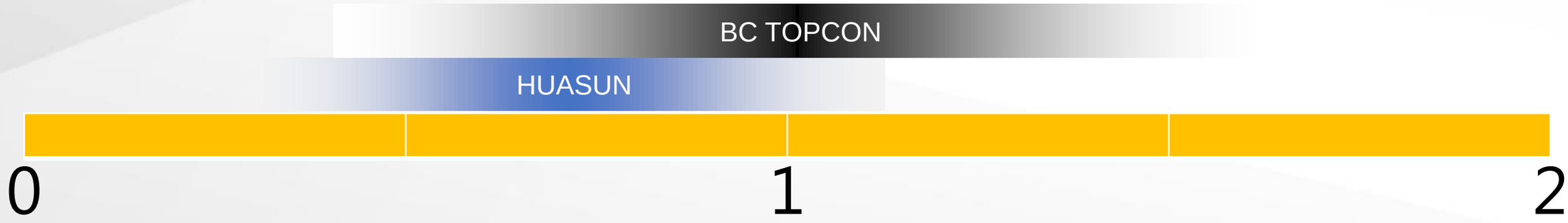
*) G12R-132 format

Higher Yield	Topcon	BC Topcon	HJT Huasun
Bifacialty	80% ±5%	70% ±5%	95%**
Other Yield Parameters	TC 0.29%	TC 0.26%	TC 0.24%

**) Module made for vertical PV. Standard modules with 90% ±5% Bifaciality.

What is the impact? Installation cost savings

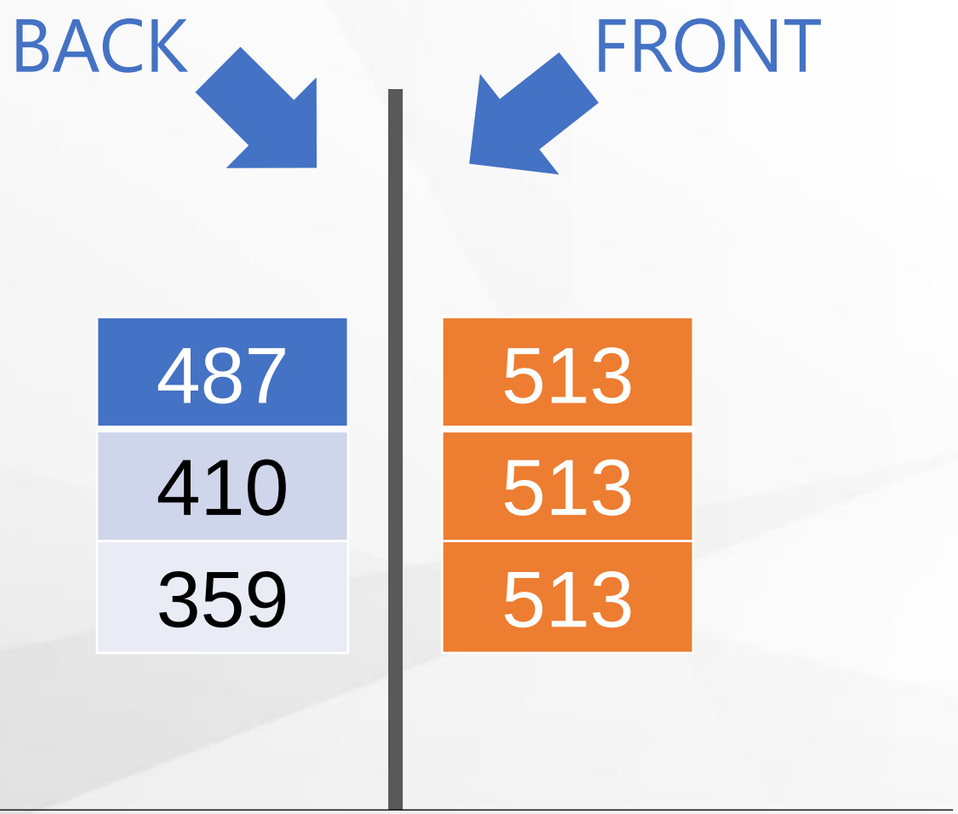
Lower Installation Cost	Topcon	BC Topcon	HJT Huasun
High Fixed Tilt	-	0.9c	0.6c
High Tracker	-	1.5c	1.0c
Vertical	-	0.5c	0.4c
Fixed Tilt	-	0.4c	0.3c
Tracker	-	0.9c	0.6c



What is the impact of module choice in yield?
The performance showdown

Higher Yield	Topcon	BC Topcon	HJT Huasun
High Fixed Tilt	-	0.3%	1.4%
High Tracker	-	-0.6%	2.5%
Vertical	-	-4.8%	8.7%
Fixed Tilt	-	-0.1%	2.1%
Tracker	-	-0.5%	2.5%

Does high bifaciality really improve yield that much for vertical?



Vertical E-W has equal irradiance at each side

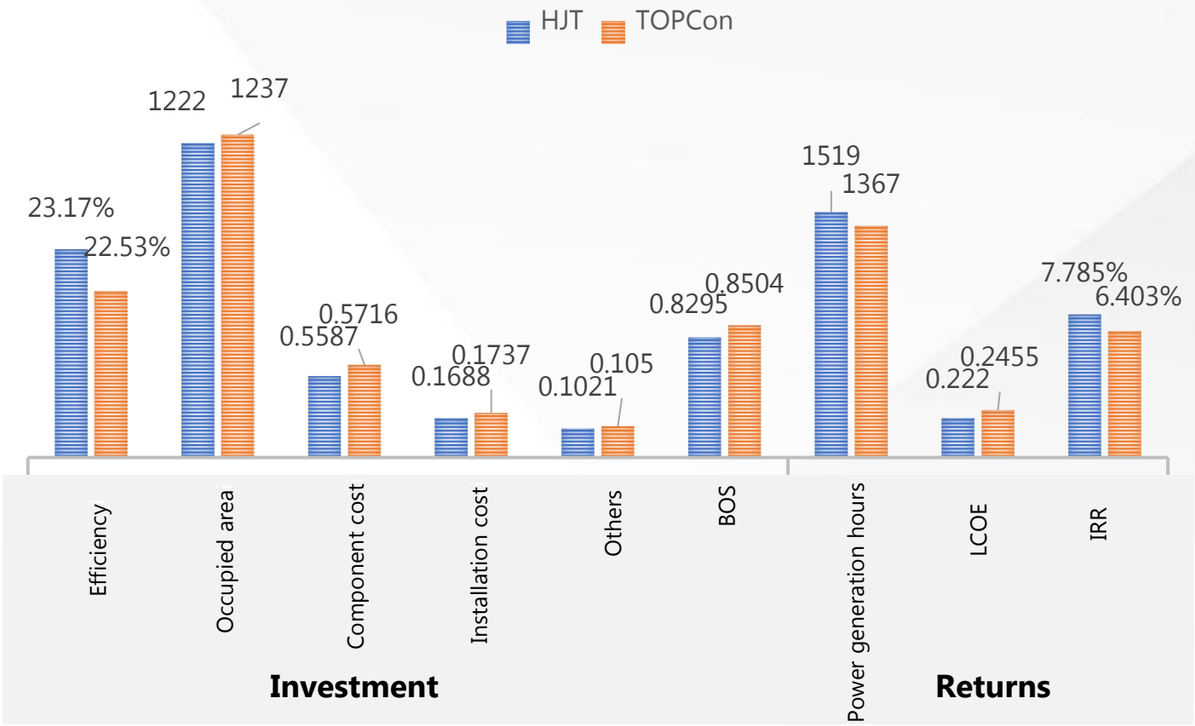
TECH	YIELD*	Front	Back
HJT	1,000	513	487 (95%)
Topcon	923 (-7.7%)	513	410 (80%)
BCT	872 (-12.8%)	513	359 (70%)

Our high bifaciality HJT has >95% bifaciality
Measured Topcon is at 78%
Measured BCT is at 68%

*) Adding the effect of temperature and low light, real yield advantage for HJT will be higher than the these values on the table

HJT Vertical Installation Solution for Agri-PV （ Jinta, Gansu, China)

Type	TOPCon 700W	HJT 720W	Comparison
Module power (Wp)	700	720	20W higher
Module dimension (mm)	2384*1303*33	2384*1303*33	/
1st-year power degredation	1%	1%	/
Annual linear degredation	0.4%	0.3%	0.1% lower per year
Bifaciality	80%	95%	15% higher
Array	2P	2P	/
Installation tilt (∘)	90	90	/
Front facing	west	west	/
Number of modules per string (pcs)	26	26	/
Pnom Ratio	1.51	1.51	/
Number of strings	4100	3986	114 strings less
Number of modules	106600	103636	2964 pcs modules less
AC system capacity (MW)	49.5	49.5	/
Land area (ha)	82.4667	81.4667	1ha less

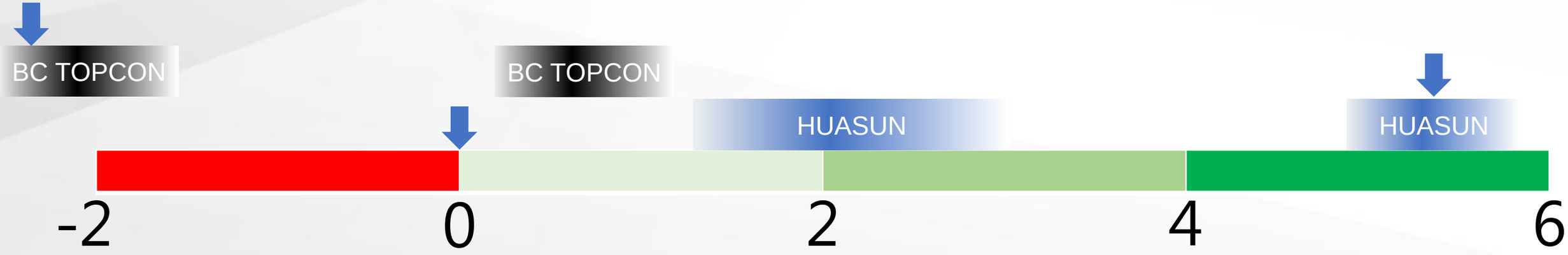


Compared to TOPCon 700W with fixed trackers, HJT 720W module has advantages:

- **0.64%** higher efficiency
- Saving **1 ha** land use and **2.45%** BOS cost
- **11.12%** more electricity generation hours in the first year
- **9.57%** lower LCOE and **1.38%** higher IRR for the solar plant

Yield and installation cost savings combined

Higher Yield	Topcon	BC Topcon	HJT
High Fixed Tilt	-	1.1c	1.5c
High Tracker	-	1.1c	2.8c
Vertical	-	-2.5c	5.4c
Fixed Tilt	-	0.4c	1.5c
Tracker	-	0.6c	2.1c



Summary

- AgriPV is coming for **many different applications and topologies**
- **All topologies** have high BoS
- **High efficiency** and **high bifaciality** will be the key
- **Yield impact** is overproportional due to **higher BoS cost**
- **HJT delivers** extraordinary results, especially in vertical systems

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